Volume 19, Issue 2

NATIONAL WEATHER SERVICE TUCSON, ARIZONA

Fall/Winter 2013-2014

Coyote Crier

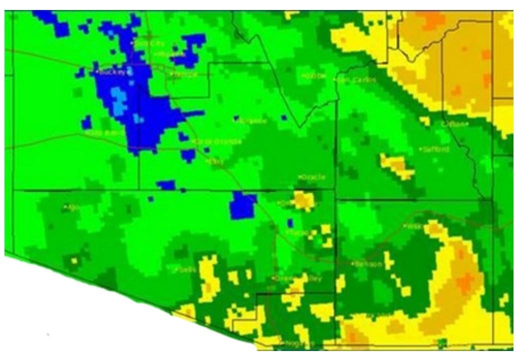
Inside this issue:

Summary of the 2013 Monsoon

By John Glueck, Senior Forecaster and Climate Focal Point

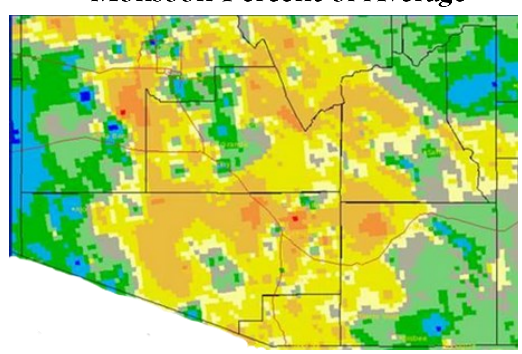
The annual Monsoon always produces areas that are rainfall winners and losers during the season. The big winner was the Douglas airport which set a new Monsoon rainfall record by recording 16.24” which broke the old record of 15.90” from 1964. On a larger scale, the southern half of Cochise County, the northern sections of Graham and Greenlee Counties, the western parts of Pima County and the remaining mountain ranges across southeast Arizona were winners by recording above average Monsoon rainfall. The percent of average image below depicts areas in yellow to orange that were the Monsoon rainfall losers, as they recorded below average rainfall.

2013 Monsoon Rainfall



Estimated totals across southeast Arizona

Monsoon Percent of Average



Green/Blue = Wetter; Yellow/Red = Drier

2013 Monsoon Rainfall Totals for Selected Cities across Southeast Arizona

Douglas Airport	16.24”	Nogales	8.85”
Coronado National Memorial	14.92”	Tombstone	7.93”
Chiricahua National Monument	14.87”	Willcox	7.85”
Kitt Peak	14.72”	Cascabel	6.95”
Y Lightning Ranch near Hereford	14.11”	Duncan	6.66”
Portal	14.09”	Oracle State Park	6.30”
McNeal	12.18”	Anvil Ranch	6.23”
Pearce-Sunsites	10.32”	Fort Thomas	6.06”
Patagonia	9.91”	Sasabe	5.96”
Arivaca	9.73”	Safford	5.42”
Organ Pipe Cactus National Monument	9.24”	Ajo	5.25”
Tumacacori	9.06”	San Manuel	4.75”
Benson	8.98”	Tucson International Airport	3.74”

Winter Outlook 2013-2014

By Glenn Lader, General Forecaster

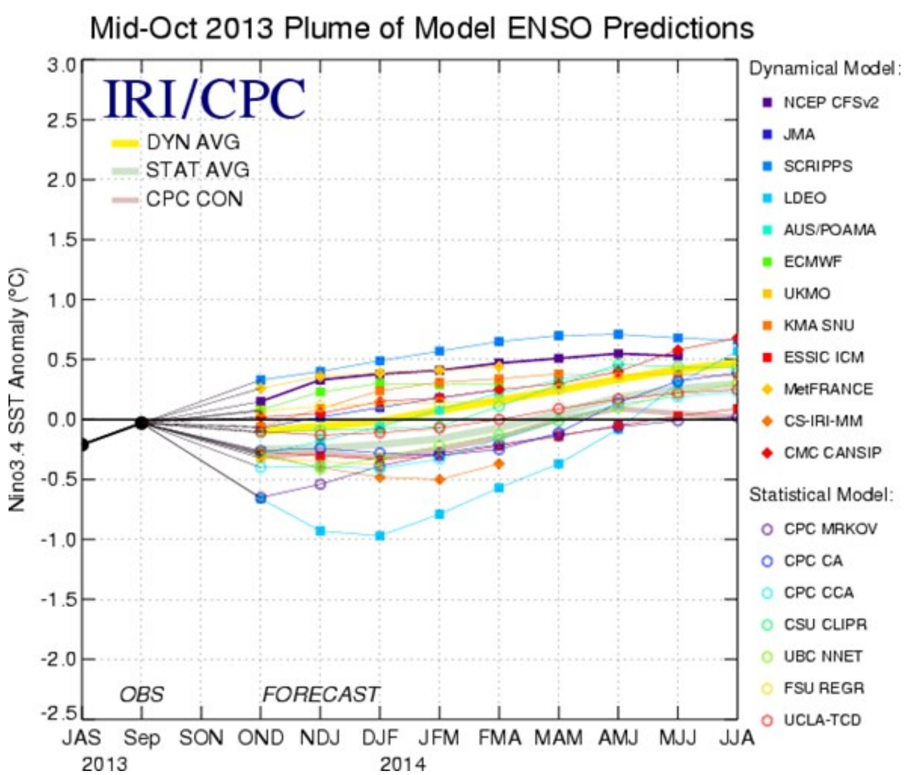
The Winter Outlook for December 2013 through February 2014 calls for a better chance of above normal temperatures and below normal precipitation across Southeast Arizona.

The biggest influence in our winter weather is the sea surface temperatures in the equatorial Pacific Ocean. When these temperatures are at least 0.5°C above normal, it is considered an El Niño and when 0.5°C or more below normal it is considered La Niña. Currently temperatures are near normal which is considered an El Nino-Southern Oscillation (ENSO) neutral state. The forecast looking ahead through this winter indicates a continued ENSO neutral state. Generally in an ENSO neutral state there are no well-defined temperature and precipitation correlations for Southeast Arizona. The strongest correlations in the winter season we see are during strong El Niño with higher than normal precipitation values.

With an ENSO neutral state you might be wondering why is the forecast for a better chance of above normal temperatures and below normal precipitation? The answer lies in a combination of the use of statistical and dynamical models that the CPC uses in its forecasts. The statistical models rely mostly upon previous data trends and observations while the dynamical models are run based on the current observations and look out into the future. Statistically, all else being equal, given the 30 year climate records being kept combined with warming trends, especially for overnight lows, there is a greater likelihood of above normal temperatures for Southeast Arizona. Meanwhile, for precipitation, the statistical and dynamical models are favoring a below normal winter for precipitation.

Meanwhile, the long term drought continues so any precipitation we can get before the traditionally dry spring season is beneficial.

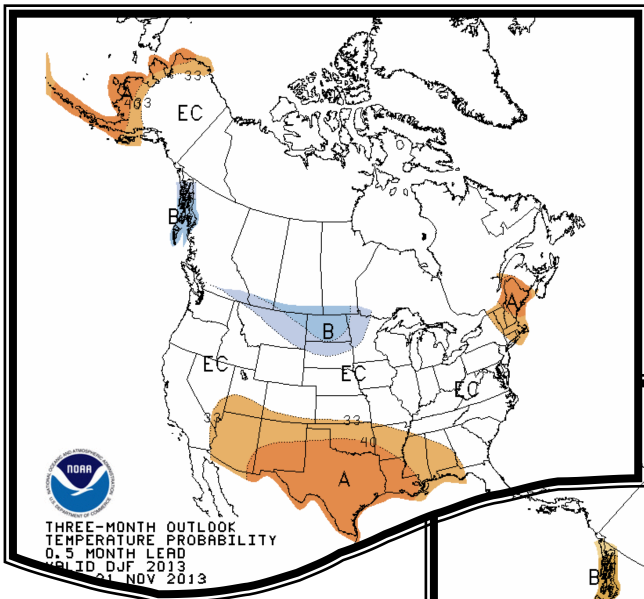
"The biggest influence in our winter weather is the sea surface temperatures in the equatorial Pacific Ocean."

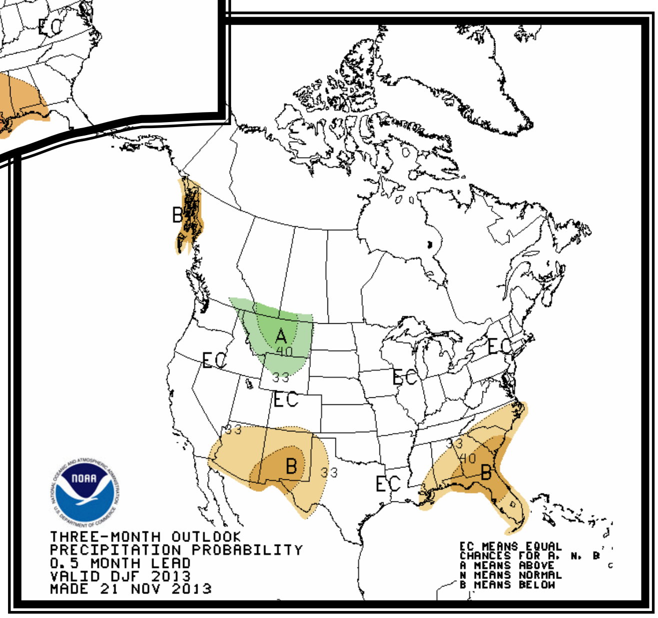


Winter Outlook 2013-2014

By Glenn Lader, General Forecaster

December—February Temperature Outlook

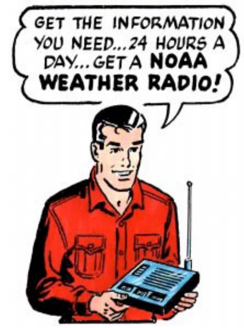




December—February Precipitation Outlook

Please keep your personal information up-to-date. Do we have your correct mailing address, location, phone number and e-mail address? If not, please update us so that our database is as current as possible. The best way to update your information is by e-mail, or to call and speak with Greg Mollere. Thanks!

Greg.Mollere@noaa.gov



"Meanwhile, the long term drought continues so any precipitation we can get before the traditionally dry spring season is beneficial."

Launching Weather Balloons and Avoiding Obstacles

By John J. Brost, Science and Operations Officer

The data retrieved from launching weather balloons is invaluable to weather forecasting. The balloon itself merely serves as the lifting mechanism that carries a sophisticated instrument, called a radiosonde, upwards of 100,000 feet into the atmosphere. This article is not intended to discuss the balloon or the instrument in detail. If you would like more information on the weather balloon, or the equipment we send up with the balloon, go to this link: http://www.noaa.gov/features/02_monitoring/balloon.html

This article is about something bigger - much bigger in fact. As it turns out, the weather forecast office in Tucson is considered a non-traditional weather balloon launching site. The reason is due to our launch location. We fill and release our balloon from the roof of the Environment and Natural Resources Building on the campus of the University of Arizona.

This image shows our launch facility on the roof of our building looking from the east to the west. We first place the balloon inside this green bucket and then cover it with canvas to keep it from floating away as we fill it with helium.

Notice the abundant blue sky in the background. When the winds blow from east to west, our balloons travel safely into the atmosphere with no obstructions to cause us any concern.

Most National Weather Service offices that release weather balloons are located in the middle of nowhere, so to speak. They are often co-located with airports or in rural areas near a major city or town. In addition, the balloon launching facilities at these offices are located a few hundred feet away from the associated Weather Service building. In other words, most offices do not have any major obstructions when they release weather balloons.

In the past, our office has dealt with unique wind patterns that occur around buildings called "eddies". These "eddies" are like tiny vortices that swirl around the edges of a building. When launching a balloon, an eddy can actually force the balloon down toward the ground or cause it to impact the side of the building. Either way, that poses challenges to launching a weather balloon. In addition, we have a weather observing station and a ~15 foot tall satellite dome on our roof right next (due east) to our launch site. These obstructions and unique wind flow patterns have caused us to lose weather balloons in the past, but we have learned how to avoid these objects. So today, these obstructions rarely impact a balloon launch.

During the summer, the University of Arizona began construction on a new building directly east of our office. Our building is three stories and about 45 feet tall. The new building will be almost twice as tall as our building. To construct a building this large, the construction company uses a large crane. In this case, the crane is placed where the center of the new building will be. The image on the next page shows you a mock drawing that compares our building to the new building and highlights the location and size of the crane.

You can really gain a sense of scale from this photo. The crane is MASSIVE. At least, it is massively tall compared to our building. This crane will help construct the new building through roughly June 2014. During this period, the crane will serve as a massive obstacle when launching weather balloons.

Hitting the crane with a balloon is a terrible idea. Not only would we lose the balloon and weather data, but we could potentially cause serious safety concerns for the crane operator. Our weather observing equipment, the radiosonde, is attached to the balloon by a string. If that string were to be-

"Most National Weather Service offices that release weather balloons are located in the middle of nowhere, so to speak."

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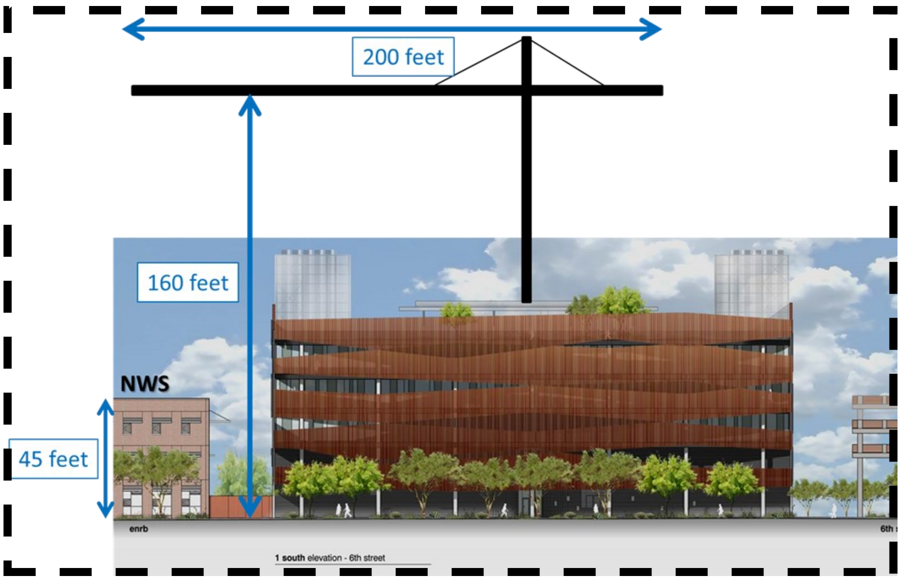


come entangled in the crane, somebody would need to remove it. How excited would you be to climb out on the boom of the crane, which is 160 feet in the air, to detangle a weather balloon? I would not want that job.

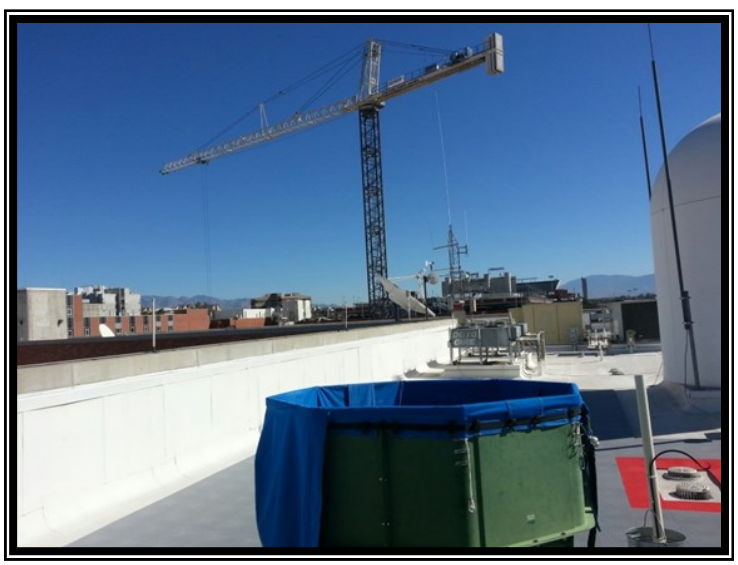
So hitting the crane is not an option. However, we also do not want to lose a ton of weather balloons by being overly cautious during the launches. Remember, the data is vital to our operations. Missing three or four flights a year is reasonable, but missing 40 or 50 due to a crane could severely degrade our forecasts. The solution – use the winds and a little science!

We developed a massive spreadsheet that tries to identify good and bad launch conditions. We can measure the wind speed and direction with our observing equipment on our roof and the roof of the atmospheric sciences building. We also know what wind directions would push the balloon toward the crane. Finally, we have a decent idea of how fast the balloon rises into the atmosphere. This is called an ascension rate. We need to maintain a specific ascension rate in order to ensure good quality data is recorded.

The problem is that the ascension rates can vary, especially near the launch site. Remember those eddies I mentioned earlier? An eddy can cause a negative ascension rate when the balloon goes down toward the ground for a brief moment after launch. We can add or subtract gas from the balloon to modify the ascension rates, but this is not an exact science. Plus, wind gusts or unexpected wind shifts can rapidly push the balloon toward the crane faster than we might anticipate.

In other words, we cannot know every detail about the flight of the balloon. However, we do have one thing on our side. The crane flows freely with the wind when it is not in operation and when the winds exceed about 10 mph. In essence, the crane becomes a giant wind vane. The crane operators typically stop using the crane 30 minutes before we launch our balloons. So we simply note the position of the crane, the wind speed and direction, and calculate our chances of hitting the crane using our spreadsheet.

We still take a fairly conservative approach when launching the balloon as we absolutely must avoid hitting the crane. However, we no longer feel we are at risk for missing 40 or 50 flights this year. Instead, using sound science, we figure that the crane may only cause us to miss around 10 to 15 flights.



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